

What is claimed is:

1. A method of synthesizing a particulate zero strain lithium titanate intercalation compound comprising:

providing a homogeneous precursor mixture comprising nanostructure TiO_2 and at least one thermolabile source of lithium ions;

heating said precursor mixture rapidly to an annealing temperature of about 750-800°C;

holding said mixture at said annealing temperature for a period of time not substantially longer than that required to effect the maximum available reaction of said mixed precursor components in synthesizing said intercalation compound particles; and

cooling said synthesized particles rapidly to a temperature below the reaction temperature required for the synthesis of said intercalation compound, thereby preventing further growth of said particles.

2. A method according to claim 1 wherein said step of heating said precursor mixture comprises heating to said annealing temperature in about 2 minutes in the presence of a heating medium.

3. A method according to claim 2 wherein said heating medium consists essentially of ambient atmosphere.

4. A method according to claim 1 wherein said step of holding said mixture comprises holding at said annealing temperature for about 15-30 minutes in the presence of a heating medium.

1 5. A method according to claim 4 wherein said heating medium
2 consists essentially of ambient atmosphere.

1 6. A method according to claim 1 wherein said step of cooling
2 said synthesized particles comprises cooling below said reaction
3 temperature in about 2 minutes in the presence of a cooling
4 medium.

1 7. A method according to claim 6 wherein said cooling medium
2 consists essentially of ambient atmosphere.

1 8. A nanostructure particulate zero strain lithium titanate
2 intercalation compound.

1 9. A particulate lithium titanate intercalation compound
2 synthesized by a method comprising:

3 providing a homogeneous precursor mixture comprising
4 nanostructure TiO_2 and at least one thermolabile source of
5 lithium ions;

6 heating said precursor mixture rapidly to a reactive
7 annealing temperature of about 750-800°C;

8 holding said mixture at said annealing temperature for a
9 period of time not substantially longer than that required to
10 effect the maximum available reaction of said mixed precursor
11 components in synthesizing said intercalation compound
12 particles; and

13 cooling said synthesized particles rapidly to a temperature
14 below the reaction temperature required for the synthesis of

15 said intercalation compound, thereby preventing further growth
16 of said particles.

1 10. A rechargeable electrochemical cell comprising:
2 a negative electrode member comprising a first
3 electrochemically active material;
4 a positive electrode member comprising a second
5 electrochemically active material; and
6 a separator member comprising an electrolyte interposed
7 between said negative and positive electrode members;
8 wherein at least one of said active materials comprises a
9 nanostructure particulate zero strain lithium titanate
10 intercalation compound.